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# Port Everglades Macroinvertebrate Monitoring: Monitoring of Benthic Macroinvertebrate Assemblages at the Southport Turning Basin and Adjacent Areas of John U. Lloyd State Recreation Area: August 1994 [Interim Report]

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# PORT EVERGLADES MACROINVERTEBRATE MONITORING:

## MONITORING OF BENTHIC MACROINVERTEBRATE ASSEMBLAGES AT THE SOUTHPORT TURNING BASIN AND ADJACENT AREAS OF JOHN U. LLOYD STATE RECREATION AREA: AUGUST 1994

## [INTERIM REPORT]

**Prepared for:**

**Port Everglades Authority**

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## A. INTRODUCTION

This report documents the August 1994 monitoring of benthic macroinvertebrate assemblages in the Port Everglades Southport turning basin vicinity and adjacent areas of John U. Lloyd State Recreation Area. This is the seventh monitoring effort of the series carried out by Nova Southeastern University Oceanographic Center. Grab samples were taken chiefly during the first two weeks of August. Hand collections and most crab survey stations were delayed until the first half of September (with three crab stations taken on 5 October). This is an interim report. Nemertine and annelid worms and a few groups of crustaceans have not yet been returned with identifications by consultants.

## B. METHODOLOGY

Figure 1 illustrates locations of stations occupied for the January 1994 sampling period and the kind of sample (Ponar grab, crab census, or hand collection) taken at each.

Shannon-Weaver Diversity Indices are calculated for each station and, at Ponar grab stations, for each replicate as well using the following equation:

$$H' = -\sum_{i=1}^{s} p_i \ln p_i$$

where $p_i$ is the relative abundance of species $i$. H' increases with increasing number of species $S$. For any given $S$, H' reaches a maximum value ($H'_{max}$) when all values of $p$ are equal ($p_1 = p_2 = p_3 ...$), and H' equals ln $S$. Because H' is primarily affected by species number rather than by abundances of common or rare species, or by species of moderate abundance, evenness (J') has also been calculated for each station and replicate using the equation:

$$J' = H'/H'_{max} = H'/\ln S$$

As a ratio between the diversity index (H') for a given sample and the maximum possible diversity index ($H'_{max}$) for the number of species and specimens in that sample, evenness (J') gives an indication of how close the data come to maximum possible diversity.

### B.1. Grab Samples

Benthic grab samples are taken according to contract specifications with a 225 $cm^2$ grab sampler[1] at stations 1, 8, 8a, 9, 10a, 11, 13a, 14, 17, 18 and 19a, with three replicate samples at each station. All samples are fixed in 5% seawater buffered formalin with rose bengal stain and sieved through a 0.5 mm mesh screen. Organisms and sediment retained on the screen are transferred to 70% ethanol and sorted to most specific distinguishable taxa. Taxa are either identified or sent to recognized experts for identification (Table 6). Nematodes and harpacticoid copepods have not been enumerated or included in diversity calculations. These organisms are normally treated as meiofauna, not macrofauna. The relatively few large specimens retained by a 0.5 mm mesh screen do not accurately reflect their true abundances. Similarly, a small number of planktonic organisms (e.g., calanoid copepods) accidentally collected by the grab sampler have likewise not been included in counts and diversity calculations.

Modifications in sampling and handling protocols instituted during the August 1991 survey to improve sampling accuracy in conformity with contract specifications are described in previous reports and have been maintained. Depths recorded for Ponar stations below may differ from those recorded previously because of tidal variations.

### B.2. Crab Collections

Three 1.0-$m^2$ replicate quadrats are randomly placed within about 2.0 m of each other at stations 1a, 2, 3, 4, 5, 6 ,7, 10, 12, 13, 15 and 16. Within each quadrat, all crab burrows are counted and 10% excavated, and the inhabitants counted and identified in the field or collected and identified in the laboratory, according to contract specifications. Modifications in sampling and handling protocols instituted during the August 1991 survey to improve sampling accuracy in conformity with contract specifications are described in previous reports and have been maintained.

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[1] Contract specifications call for a 225 $cm^3$ grab sampler, but this is clearly an error. Such a grab sampler, about 6 cm on a side, was not used by the previous contractor and is not, to our knowledge, manufactured.

### B.3 Hand Collections

Hand collections are taken at stations 9, 13, and 17, with three replicates at each station. Each replicate sample covers an area of $0.1m^2$. Justification for this sampling area is discussed in the survey report for August 1991. Organisms identifiable in the field are counted and released. Taxa unidentifiable in the field are collected by hand, with forceps, or by agitating algae-covered rocks in a bag of seawater. Collected specimens are placed in plastic bags with seawater, fixed in 10% buffered seawater formalin in the laboratory, and finally stored in 70% ethanol.

Modifications in sampling and handling protocols instituted during the August 1991 survey to improve sampling accuracy in conformity with contract specifications are described in previous reports and have been maintained.

## C. RESULTS

### C.1. Ponar Grab Samples

Table 1 lists raw data for all samples by station and by replicate for all groups. Table 2 summarizes numbers of specimens by major taxonomic group. Table 3 summarizes relative abundances of major taxonomic groups (percent occurrence). Values may change when nemertine, annelid and all crustacean groups are completely identified. For example, individual specimens considered as fragments following second-stage sorting and thus not included in group totals may be identified by consultants and included in final enumerations.

A total of 6769 specimens was sorted from the 33 grab samples (11 stations with three replicates each). This represents a substantial decrease relative to the last several surveys. Lower numbers have not been seen since the January 1992 survey. A complete appraisal of the grab sample fauna will be included in the final version of this report when all identifications have been included.

### C.3. Crab Census

Table 4 lists all crab census data including numbers of burrows, species and specimens, diversity indices and evenness values. The grapsid *Sesarma curacaoense* is the most abundant ground-dwelling taxon, followed by much smallernumbers of *Uca thayeri, U. rapax, U. speciosa*, and *Uca* sp. (juv.) As in most previous surveys, *S. curacaoense*, *U. thayeri* and *U.*

*speciosa* are restricted to stations on the west side of the ICWW, while *U. rapax* occurs only on the east side of the ICWW.

Tree crabs (*Aratus pisonii*) are present in low numbers, if at all. Station 16 again exhibits the highest count. All crab census results are summarized below.

Station 1a: Edge of red mangrove fringe adjacent to rip rap at northeast corner of Southport Turning Notch. Crab census data: *Sesarma curacaoense* (1), *Uca thayeri* (1), *Uca* sp. (juv.)(3); *Aratus pisonii* (0 specimen in 1 tree/$m^2$). Number of burrows by replicate: 98, 63, 83. Shannon-Weaver Diversity Index (H'): 0.950. Evenness (J'): 0.865.

Station 2: In dense red mangrove fringe 10 m north of Turning Notch and 10 m west of ICWW. Crab census data: *Sesarma curacaoense* (6), *Uca speciosa* (1); *A. pisonii* (0 in 2 tree/$m^2$). Number of burrows by replicate: 87, 67, 65. H': 0.410. J': 0.592.

Station 3: In dense red mangrove fringe 3 m east of natural drainage canal, 10 m north of Turning Notch. Crab census data: *S. curacaoense* (1), *U. thayeri* (1); *A. pisonii* (0 in 1 tree/$m^2$). Number of burrows by replicate: 84, 69, 68. H': 0.693. J': 1.000.

Station 4: In dense red mangrove fringe 10 m north of Turning Notch and approximately 40 m west of drainage canal. Crab census data: *S. curacaoense* (8), *U. thayeri* (1); *A. pisonii* (3 in 2 tree/$m^2$). Number of burrows by replicate: 59, 95, 84. H': 0.500. J': 0.792.

Station 5: In dense red mangrove fringe 30 m north of station 4. Crab census data: *S. curacaoense* (3), *U thayeri* (3); *A. pisonii* (0 on 2 trees/$m^2$). Number of burrows by replicate: 64, 76, 97. H': 0.693. J': 1.000.

Station 6: In dense red mangrove fringe 3 m east of natural drainage canal and 10 m north of station 3. Crab census data: No crabs; *A. pisonii* (0 in 1 trees/$m^2$). Number of burrows by replicate: 112, 108, 63.

Station 7: In dense red mangrove fringe 30 m north of station 2. Crab census data: *S. curacaoense* (2), *Uca* sp. (juv.)(1); *A. pisonii* (0 in 1 trees/$m^2$). Number of burrows by replicate: 63, 74, 87. H': 0.637. J': 0.918.

Station 10: In open area among scattered large red mangroves east of the center of small island on east side of ICWW north of northern entrance to Whiskey Creek. Crab census data: *Uca rapax* (1), *Uca* sp. (juv.)(1); *Aratus pisonii* (0 in 1 trees/$m^2$). Number of burrows by replicate: 7, 25, 8. H': 0.693. J': 1.000.

Station 12: On high ground among Australian pine trees at a point intersected by lines running due east from station 11 (north side of northern entrance to Whiskey Creek) and due north of station 13. Crab census data: no crabs, no burrows.

Station 13: On sand among shrubby white mangroves north side of Whiskey Creek approximately 20 m west of North Ocean Drive bridge. Crab census data: *Uca rapax* (3); *Aratus pisonii* (0 in 0 trees/$m^2$). Number of burrows by replicate: 8, 14, 17. H': 0. J': 0.

Station 15: Among dense red mangrove fringe 35 m west of North Ocean Drive on line running east of north side of Turning Notch. Crab census data: No crabs; *Aratus pisonii* (0 in 3 trees/$m^2$). Number of burrows by replicate: 0, 7, 31. H': 0. J': 0.

Station 16: Among red mangroves 110 m east of North Ocean Drive on line running due east of north side of Turning Notch. Crab census data: *S. curacaoense* (1), *Uca rapax* (1); *A. pisonii* (8 on 1 tree/$m^2$). Number of burrows by replicate: 53, 74, 83. H': 0.693. J': 1.000.

**C.5. Hand Collections**

A total of 489 specimens representing 12 taxa was collected at the three hand collection stations. Table 5 lists all raw data, diversity indices and evenness values by station and by replicate. Numbers of barnacles at station 9 were interpolated from about 40 collected and identified specimens.

The springtail insect, *Anurida maritima*, accounts for 37% of all organisms enumerated, and the snail, *Batillaria minima*, 30%. Barnacles are again chiefly *Chthamalus stellatus*. Results are summarized below.

Station 9: Intertidal rubble in a red mangrove fringe protected from heavy wave action by adjacent rip-rap on the southwestern corner of a small island along the east side of the ICWW just north of the northern entrance to Whiskey Creek. Numerous rocks with chiefly red algal turf, some greeen algae and black encrusting cyanobacteria. H': 1.578. J': 0.635.

The gastropod *Batillaria minima* is the most abundant organism, followed by the barnacle *Chthamalus stellatus* and the vermetid gastropod ?*Petaloconchus varians*. The latter is again more abundant than previously. Adjacent boulders (rip-rap) appear to support the same intertidal fauna as recorded in previous surveys.

Station 13: Intertidal muddy sand with numerous small rocks, pebbles and shells on the north side of Whiskey Creek, about 15m west of the North Ocean Drive bridge; replicates taken 0.5 m above receding tide and about 30 cm below most seaward mangrove pneumatophores. Numerous *Anurida maritima* noted higher up shoreline from sample transects. Barnacles are patchily distributed on small rocks outside the transect areas. H': 1.421. J': 0.683.

Station 17: Intertidal, coarse shelly sand and gravel with filamentous green algae, among partly algae-covered red mangrove roots and white mangrove pneumatophores with partly buried rocks, west side of Whiskey Creek, on a line running due east of the north side of the Turning Notch and about 500 m north of the footbridge. Meter transects were taken along the mangrove roots closest to the water's edge. H': 0.557. J': 0.507.

*A. maritima* is still the most abundant taxon (93%). *Batillaria minima* appears in far fewer numbers than in any of the three preceding surveys. However, this station was again examined at very low tide with the transects about 1 m from the water's edge. *B. minima* was much more abundant within 0.5 m of the water's edge than in the transects.

## D. DISCUSSION

### D.1. Grab samples

A thorough discussion of grab samples will be included in the final version of this report, pending complete identification of all organisms sampled.

### D.2. Crab Censuses

Crab abundance on the west side of the ICWW north of the Turning Notch is greater than reported in January 1994, but is only about a third that of August 1993. Tree crabs (*Aratus pisonii*) are again few in number. The fauna at these stations remains similar to that found in previous surveys: *Sesarma curacaoense, Uca thayeri* and *U. speciosa. Eurytium limosum* was again not among crabs identified. The tendency found during the three surveys preceding the last (August 1992 through August 1993) toward greater numbers of *Aratus pisonii* at the three stations within the mangrove forest (5-7) was again not visible in this survey.

A single specimen of *S. curacaoense* was again found at station 16: the first time since August 1992. *Uca rapax* was collected at three out four stations on the east side of the ICWW

and has been recorded at station 16 in the last five surveys. *Uca pugilator*, formerly common at station 13, was not found there in this survey.

### D.3. Hand Collections

Station 9 continues to maintain a typical intertidal fauna. This survey records most of the species found in earlier surveys. Barnacles and other typical intertidal organisms (e.g., isognomonids) remain abundant on adjacent rip-rap. Species richness remains as high as in the January 1994 survey, but the diversity index has declined slightly. The vermetid gastropod, ?*Petaloconchus varians*, continues to increase in numbers here. It is almost twice as abundant as in January 1994.

The gastropod, *Batillaria minima*, is again the most abundant species at station 13, outnumbering the springtail insect, *Anurida maritima*. These organisms, however, move up and down the shore with the tide and their numbers counted within the transect areas at any given moment may not accurately reflect population sizes. The small numbers of barnacles again appears due to the patchy distribution of the larger rocks that barnacles appear to prefer.

Both species richness and diversity are slightly higher at station 13 than in the previous three surveys, due to reduced dominance by *A. maritima* and *B. minima*. Low diversity at station 17 continues, due to dominance by *A. maritima*.

LIST OF TABLES

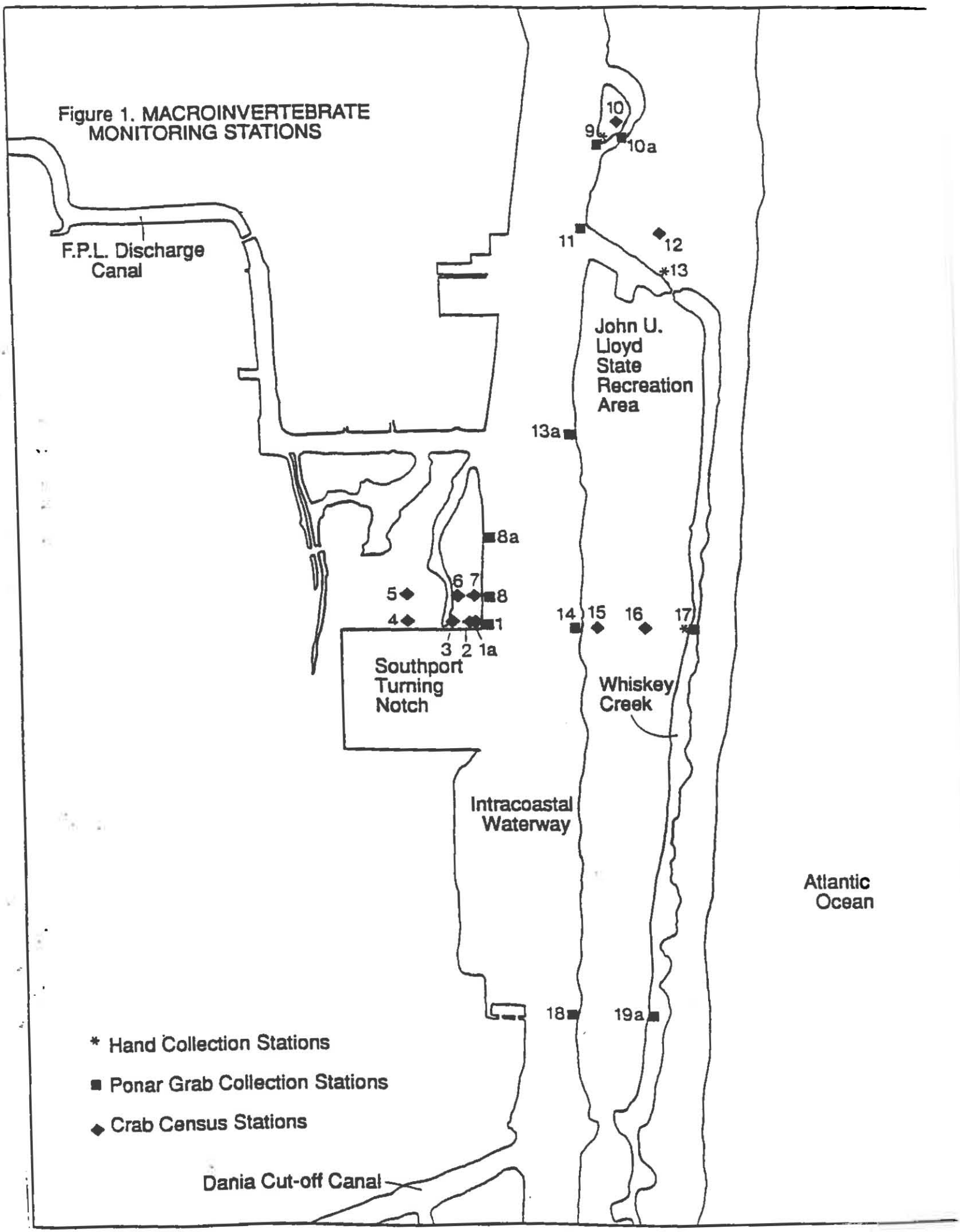
Figure 1. MACROINVERTEBRATE MONITORING STATIONS
F.P.L. Discharge Canal
10
9
10a
11
12
13
John U. Lloyd State Recreation Area
13a
8a
5
6
7
8
4
1
3
2
1a
14
15
16
17
Southport Turning Notch
Whiskey Creek
Intracoastal Waterway
Atlantic Ocean
18
19a
* Hand Collection Stations
■ Ponar Grab Collection Stations
◆ Crab Census Stations
Dania Cut-off Canal

TABLE 1. Grab Collection Stations: raw data, August 1994.

| STATION | | 1 | | | 8 | | | 8a | | | 9 | | | 10a | | | 11 | | | 13a | | | 14 | | | 17 | | | 18 | | | 19a | | TOT |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| REPLICATE | 1 | 2 | 3 | 1 | 2 | 3 | 1 | 2 | 3 | 1 | 2 | 3 | 1 | 2 | 3 | 1 | 2 | 3 | 1 | 2 | 3 | 1 | 2 | 3 | 1 | 2 | 3 | 1 | 2 | 3 | 1 | 2 | 3 | |
| TAXON | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Phylum CNIDARIA | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Order ACTINIARIA | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Unident. actinian | 4 | | | | 2 | | 4 | 2 | | | | | | | | | | | | 2 | | | | | | | | | | | | | | 14 |
| Phylum NEMERTINA | 4 | 14 | 12 | 16 | 12 | 6 | 4 | 2 | 18 | | | | | | | | | 2 | | 12 | 4 | 10 | 22 | 2 | | 1 | 2 | 26 | | 3 | | | | 172 |
| Phylum MOLLUSCA | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Class GASTROPODA | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Family CAECIDAE | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Caecum pulchellum | 6 | 20 | 6 | 8 | | 18 | 8 | 10 | 14 | | | | | | | 16 | 2 | 4 | 4 | 4 | 6 | 30 | | | 314 | 105 | 54 | 30 | 26 | 19 | | | | 704 |
| Caecum imbricatum | | | | | | | | | | | | 1 | | | | | | | | | | | | | 256 | 76 | 116 | | | | | | | 449 |
| Meioceras nitidum | | | | | | | | | 6 | | | | | | | 2 | | | | | | | | | | | | 4 | | 2 | | | | 14 |
| Family CYCLOSTREMATIDAE | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Skenea sp. | | | | | | | | | | | | | | | | | | | | | | | | | | 1 | | | | | | | 2 | 3 |
| Family CERITHIDAE | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Cerithium atratum | | | | | | | | | | | | | | | | | | | | | | 4 | | | | | | | | | | | | 4 |
| Cerithium lutosum | | | | | | | | | | | | | | 2 | | | | | | | | | | | | | | | | | | | | 2 |
| Family NERITIDAE | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Neritina virginea | | | | | | | | | | | | | | | | | | | | | | 2 | | | | | | | | | | | | 2 |
| Family POTAMIDIDAE | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Batillaria minima | | | | | | | | | | | | | | | | | | | | | | | | | 22 | 46 | 78 | | | | | | 17 | 163 |
| Family NASSARIIDAE | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| ?Nassarius sp. | | | | | | | | | | | | | | | | | | | | | | | | | | 1 | | | | | | | | 1 |
| Family NATICIDAE | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Unidentified naticid (juv.) | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 1 | 1 |
| Family APLUSTRIDAE | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| ?Hydatina vesicaria | | | 4 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 4 |
| Family BULLIDAE | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Bulla striata | | | 2 | | | | | 2 | 2 | | | | | | | | | | | | | 2 | | 2 | | | | 6 | | | | | | 16 |
| Family HAMINOEIDAE | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Haminoea sp. | | | | | | | | | | | | | | | | | | | | | | | | | | 1 | | 2 | | | | | | 3 |
| Unidentified gastropod | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 2 | | 2 |
| Class BIVALVIA | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Family LUCINIDAE | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Unident. lucinid | | | 2 | | | | | | | | | | | | | | | | | | | | | | | | | | | 2 | | | | 4 |
| Family TELLINIDAE | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Macoma constricta | | | | | | | | 6 | 4 | | | | | 4 | | | | | | | | 2 | | | | | | | | | | | | 16 |
| Tellina iris | | | | | 2 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 2 |
| Family VENERIDAE | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Anomalocarida auberiana | | | | | | | | | | | | | | | | | | | | | | | | | | | 2 | | | | | | | 2 |
| Chione cancellata | | | | | | | | | | | | | | | | | | | 2 | | | | | | | | | | | | | | | 2 |
| Phylum ANNELIDA | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Class POLYCHAETA | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Order CAPITELLIDA | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Family CAPITELLIDAE | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

TABLE 1. Grab Collection Stations: raw data, August 1994.

| STATION | | 1 | | | 8 | | | 8a | | | 9 | | | 10a | | | 11 | | | 13a | | | 14 | | | 17 | | | 18 | | | 19a | | TOT |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| REPLICATE | 1 | 2 | 3 | 1 | 2 | 3 | 1 | 2 | 3 | 1 | 2 | 3 | 1 | 2 | 3 | 1 | 2 | 3 | 1 | 2 | 3 | 1 | 2 | 3 | 1 | 2 | 3 | 1 | 2 | 3 | 1 | 2 | 3 | |
| TAXON | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Capitella capitata | | | | | | | | | | | | | 16 | | | | | | | | | | | | | | | | | | | | | 16 |
| Order PHYLLODOCIDA | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Family SYLLIDAE | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Ehlersia cornuta | | | | | | | | | | | | | | | | | | | | | | | | | 64 | 48 | 90 | | | | | | | 202 |
| Order EUNICIDA | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Family EUNICIDAE | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Nematonereis hebes | | | | | | | | | | | | | | | | | | | | | | | | | 50 | 64 | 62 | | | | | | | 176 |
| Unidentified polychaetes | 32 | 32 | 50 | 58 | 60 | 36 | 34 | 52 | 54 | 44 | 52 | 56 | 62 | 32 | 20 | 64 | 44 | 44 | 30 | 100 | 82 | 286 | 92 | 74 | 8 | 9 | 18 | 48 | 82 | 25 | | 5 | 12 | 1697 |
| Class OLIGOCHAETA | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Unidentified oligochaetes | 43 | 32 | 94 | 70 | 48 | 66 | 46 | 20 | 30 | | | | 38 | 2 | 8 | | 4 | | 6 | 32 | 26 | 84 | 16 | 24 | 4 | 60 | 74 | 8 | | | 20 | | 34 | 889 |
| Phylum SIPUNCULA | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Order GOLFINGIIFORMES | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Family PHASCOLIONIDAE | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Phascolion cryptum | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 2 | | 17 | 19 |
| Order ASPIDOSIPHONIFORMES | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Family ASPIDOSIPHONIDAE | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Aspidosiphon cf. muelleri | | | | | | | | | | | | | | | | | | | | | | | | | 22 | 145 | 184 | | | | | | | 351 |
| Unident. sipunculan | 1 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 1 |
| Phylum ARTHROPODA | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Subphylum CRUSTACEA | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Class OSTRACODA | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Subclass MYODOCOPA | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Family RUTIDERMATIDAE | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Rutiderma darbyi | | | | | | | | | | | | | | | | | | | | | | | | | 96 | 105 | 44 | | | | | | | 245 |
| Subclass PODOCOPA | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Family CYTHERIDIDAE | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Cyprideis americana | | | | | | | | | | | | | 62 | 58 | 25 | | | | | | | | | | | | | | | | | | 1 | 146 |
| Peratocytheridea setipunctata | | | | | | | | | | | | | 2 | | 2 | | | | | | | | | | | 3 | | | | | | | | 7 |
| Unidentified ostracode | | | | | | | | | | 1 | | | | | | | | | | | | | | | | | | 2 | | | | | | 3 |
| Class MALACOSTRACA | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Order CUMACEA | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Unidentified cumacean | | | 2 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 2 |
| Order TANAIDACEA | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Family KALLIAPSEUDIDAE | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Kalliapseudes aliciae | | | | | | | | | | | | | | | | | | | | | | | | | 288 | 335 | 310 | | | | 2 | | | 935 |
| Family PARATANAIDAE | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Leptochelia rapax | | | | | | | | | | | | | 44 | | 9 | | | | | | | | | | 10 | 13 | 8 | | | | | | | 84 |
| Family TANAIDAE | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Sinelobus stanfordi | | | | | | | | | | | | | | | | | | | | | | 2 | | | | | | | | | | | | 2 |
| Order ISOPODA | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Family ANTHURIDAE | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Unidentified anthurid | | | | | | | | | | | | | | | | | | | | | | | | | | | 14 | | | | | | | 14 |
| Family HYSSURIDAE | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

TABLE 1. Grab Collection Stations: raw data, August 1994.

| STATION | | 1 | | | 8 | | | 8a | | | 9 | | | 10a | | | 11 | | | 13a | | | 14 | | | 17 | | | 18 | | | 19a | | TOT |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| REPLICATE | 1 | 2 | 3 | 1 | 2 | 3 | 1 | 2 | 3 | 1 | 2 | 3 | 1 | 2 | 3 | 1 | 2 | 3 | 1 | 2 | 3 | 1 | 2 | 3 | 1 | 2 | 3 | 1 | 2 | 3 | 1 | 2 | 3 | |
| TAXON | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Xenanthura brevitelson | | | | | | | | | 2 | | | | | | | | | | | | | | | | | | | | | | | | | 2 |
| Family SPHAEROMATIDAE | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Exosphaeroma diminutum | | | | | | | | | | | | | | | | | | | | | | | | | 104 | 140 | 38 | | | | | | | 282 |
| Unidentified isopods | | | 2 | | | | | | | | | | | | | | 2 | | | | | 2 | | 4 | 8 | 13 | | | 4 | | | | | 35 |
| Order AMPHIPODA | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Family COROPHIIDAE | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Cerapus n. sp. | | | | | | | | | | | | | | | | | | | | | | | | | | 4 | 10 | | | | | | | 14 |
| Grandidierella bonnieroides | 1 | | | | | | | | | | | | | | | | | | | | | 2 | | | | 2 | | 12 | 8 | | | | | 25 |
| Unident. amphipod | | | | | | | | | | | | | | | | | | | | | | | | | | | 2 | | | | | | | 2 |
| Order DECAPODA | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Unidentified decapods | | 2 | | | | | 2 | | 2 | | | | | | | 4 | 2 | 4 | | | | 2 | 8 | | | | | 6 | | | | | | 32 |
| Phylum ECHINODERMATA | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Class OPHIUROIDEA | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Unidentified ophiuroid | | | | 2 | | 2 | | | | | | | | | | | | | | | | | | | | | | 2 | | | 1 | 1 | | 8 |
| TOTAL | 91 | 100 | 174 | 154 | 124 | 128 | 98 | 94 | 132 | 45 | 52 | 57 | 224 | 98 | 64 | 86 | 54 | 54 | 42 | 150 | 118 | 428 | 138 | 106 | 1246 | 1172 | 1106 | 146 | 120 | 51 | 24 | 8 | 85 | 6769 |

TABLE 2. Summary of major taxonomic groups in grab samples, January 1994.

| STATION | 1 | 8 | 8a | 9 | 10a | 11 | 13a | 14 | 17 | 18 | 19a | TOT |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | | | |
| NEMERTINA | 30 | 34 | 24 | 0 | 0 | 2 | 16 | 34 | 3 | 29 | 0 | 172 |
| MOLLUSCA | 40 | 28 | 52 | 1 | 6 | 24 | 16 | 42 | 1072 | 91 | 22 | 1394 |
| POLYCHAETA | 114 | 154 | 140 | 152 | 130 | 152 | 212 | 452 | 413 | 155 | 17 | 2091 |
| OLIGOCHAETA | 169 | 184 | 96 | 0 | 48 | 4 | 64 | 124 | 138 | 8 | 54 | 889 |
| SIPUNCULA | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 351 | 0 | 19 | 371 |
| OSTRACODA | 0 | 0 | 0 | 1 | 149 | 0 | 0 | 0 | 248 | 2 | 1 | 401 |
| PERACARIDA | 5 | 0 | 2 | 0 | 53 | 2 | 0 | 10 | 1299 | 24 | 2 | 1397 |
| OTHER | 6 | 6 | 10 | 0 | 0 | 10 | 2 | 10 | 0 | 8 | 2 | 54 |
| | | | | | | | | | | | | 0 |
| TOTALS | 365 | 406 | 324 | 154 | 386 | 194 | 310 | 672 | 3524 | 317 | 117 | 6769 |

TABLE 3. Summary of percent occurrence of major taxonomic groups in grab samples, August 1994.

| STATION | 1 | 8 | 8a | 9 | 10a | 11 | 13a | 14 | 17 | 18 | 19a | TOT |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | | | |
| NEMERTINA | 8.2 | 8.4 | 7.4 | 0.0 | 0.0 | 1.0 | 5.2 | 5.1 | 0.1 | 9.1 | 0.0 | 2.5 |
| MOLLUSCA | 11.0 | 6.9 | 16.0 | 0.6 | 1.6 | 12.4 | 5.2 | 6.3 | 30.4 | 28.7 | 18.8 | 20.6 |
| POLYCHAETA | 31.2 | 37.9 | 43.2 | 98.7 | 33.7 | 78.4 | 68.4 | 67.3 | 11.7 | 48.9 | 14.5 | 30.9 |
| OLIGOCHAETA | 46.3 | 45.3 | 29.6 | 0.0 | 12.4 | 2.1 | 20.6 | 18.5 | 3.9 | 2.5 | 46.2 | 13.1 |
| SIPUNCULA | 0.3 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 10.0 | 0.0 | 16.2 | 5.5 |
| OSTRACODA | 0.0 | 0.0 | 0.0 | 0.6 | 38.6 | 0.0 | 0.0 | 0.0 | 7.0 | 0.6 | 0.9 | 5.9 |
| PERACARIDA | 1.4 | 0.0 | 0.6 | 0.0 | 13.7 | 1.0 | 0.0 | 1.5 | 36.9 | 7.6 | 1.7 | 20.6 |
| OTHER | 1.6 | 1.5 | 3.1 | 0.0 | 0.0 | 5.2 | 0.6 | 1.5 | 0.0 | 2.5 | 1.7 | 0.8 |
| | | | | | | | | | | | | |
| TOTALS | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 |

Table 4. Crab census data. Numbers in parentheses indicate numbers of trees inside 1.0 square meter sampling area. August 1994.

| STATION | | 1a | | | 2 | | | 3 | | | 4 | | | 5 | | | 6 | | | 7 | | | 10 | | | 12 | | | 13 | | | 15 | | | 16 | | | TOT |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| REPLICATE | 1 | 2 | 3 | 1 | 2 | 3 | 1 | 2 | 3 | 1 | 2 | 3 | 1 | 2 | 3 | 1 | 2 | 3 | 1 | 2 | 3 | 1 | 2 | 3 | 1 | 2 | 3 | 1 | 2 | 3 | 1 | 2 | 3 | 1 | 2 | 3 | |
| CRAB BURROWS | 98 | 63 | 83 | 87 | 67 | 65 | 84 | 69 | 68 | 59 | 95 | 84 | 64 | 76 | 97 | 112 | 108 | 63 | 63 | 74 | 87 | 7 | 25 | 8 | | | | 8 | 14 | 17 | 0 | 7 | 31 | 53 | 74 | 83 | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| CRAB CENSUS | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Family GRAPSIDE | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Sesarma curacaoense | | | 1 | | 4 | 2 | | 1 | | 3 | 3 | 2 | 1 | 2 | | | | | 1 | | 1 | | | | | | | | | | | | | 1 | | | 22 |
| Family OCYPODIDAE | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Uca rapax | | | | | | | | | | | | | | | | | | | | | | 1 | | | | | | 1 | 1 | 1 | | | | 1 | | | 5 |
| Uca speciosa | | | | | | 1 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 1 |
| Uca thayeri | | | 1 | | | | 1 | | | | 1 | 1 | 1 | | 2 | | | | | | | | | | | | | | | | | | | | | | 7 |
| Uca sp. (juv.) | 3 | | | | | | | | | | | | | | | | | | | 1 | | | | 1 | | | | | | | | | | | | | 5 |
| Total # specimens | | 5 | | | 7 | | | 2 | | | 10 | | | 6 | | | 0 | | | 3 | | | 2 | | | | | | 3 | | | 0 | | | 2 | | 40 |
| Total # species (by station) | | 3 | | | 2 | | | 2 | | | 2 | | | 2 | | | 0 | | | 2 | | | 2 | | | | | | 1 | | | 0 | | | 2 | | |
| H' (by station) | | 0.950 | | | 0.410 | | | 0.693 | | | 0.500 | | | 0.693 | | | 0.000 | | | 0.637 | | | 0.693 | | | | | | 0.000 | | | | | | 0.693 | | |
| J' (by station) | | 0.865 | | | 0.592 | | | 1.000 | | | 0.722 | | | 1.000 | | | 0.000 | | | 0.918 | | | 1.000 | | | | | | 0.000 | | | | | | 1.000 | | |
| TREE CRAB CENSUS | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Family GRAPSIDAE | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Aratus pisonii* | 0(1) | | | 0(2) | | | 0(1) | | | 3(2) | | | 0(2) | | | 0(1) | | | 0(1) | | | 0(1) | | | | | | 0(0) | | | 0(3) | | | 8(1) | | | |

TABLE 5. Hand collection stations: raw data, diversity (H') and evenness (J'). August 1994.

| STATION | | 9 | | | 13 | | | 17 | | TOT |
|---|---|---|---|---|---|---|---|---|---|---|
| REPLICATE | 1 | 2 | 3 | 1 | 2 | 3 | 1 | 2 | 3 | |
| TAXON | | | | | | | | | | |
| Phylum MOLLUSCA | | | | | | | | | | |
| Class GASTROPODA | | | | | | | | | | |
| Family POTAMIDIDAE | | | | | | | | | | |
| Batillaria minima | 19 | 43 | 48 | 2 | 27 | 4 | | 3 | | 146 |
| Family VERMETIDAE | | | | | | | | | | |
| ?Petaloconchus varians | 22 | 25 | 10 | | | | | | | 57 |
| Class BIVALVIA | | | | | | | | | | |
| Family MYTILIDAE | | | | | | | | | | |
| Brachidontes exustus | 1 | | | 1 | | | | | | 2 |
| Family ISOGNOMONIDAE | | | | | | | | | | |
| Isognomon alatus | | 2 | | 1 | | | 1 | | | 4 |
| Family OSTREIDAE | | | | | | | | | | |
| Crassostrea virginica | | 1 | 1 | 4 | | | | | | 6 |
| Phylum SIPUNCULA | | | | | | | | | | |
| ?Phascolion sp. | | 1 | | | | | | | | 1 |
| Phylum ARTHROPODA | | | | | | | | | | |
| Subphylum CRUSTACEA | | | | | | | | | | |
| Class CIRRIPEDIA | | | | | | | | | | |
| Family BALANIDAE | | | | | | | | | | |
| Balanus amphitrite | 5 | 5 | | | 2 | 5 | | | | 17 |
| Family CHTHAMALIDAE | | | | | | | | | | |
| Chthamalus stellatus | 27 | 29 | 5 | | | | | | | 61 |
| Class MALACOSTRACA | | | | | | | | | | |
| Order AMPHIPODA | | | | | | | | | | |
| Family HYALIDAE | | 2 | | | | | | | | 2 |
| Hyale grandicornis | | | | | | | | | | |
| Order DECAPODA | | | | | | | | | | |
| Family XANTHIDAE | | | | | | | | | | |
| Unident. juv. xanthid | | 1 | | 1 | | | | | | 2 |
| Family OCYPODIDAE | | | | | | | | | | |
| Uca sp. (juv.) | | | 1 | | 2 | 1 | 2 | 2 | 1 | 9 |
| Subphylum UNIRAMIA | | | | | | | | | | |
| Class INSECTA | | | | | | | | | | |
| Order COLLEMBOLA | | | | | | | | | | |
| Family ANURIDIDAE | | | | | | | | | | |
| Anurida maritima | 8 | 8 | 17 | | 5 | 16 | 21 | 45 | 62 | 182 |
| Total # of specimens | 82 | 117 | 82 | 9 | 36 | 26 | 24 | 50 | 63 | 489 |
| Total # species (by replicate) | 6 | 10 | 6 | 5 | 4 | 4 | 3 | 3 | 2 | |
| H' (by replicate) | 1.509 | 1.623 | 1.174 | 1.427 | 0.811 | 1.029 | 0.456 | 0.392 | 0.082 | |
| J' (by replicate) | 0.842 | 0.705 | 0.655 | 0.887 | 0.585 | 0.742 | 0.415 | 0.357 | 0.118 | |
| Total # species (by station) | | 12 | | | 8 | | | 4 | | |
| H' (by station) | | 1.578 | | | 1.421 | | | 0.304 | | |
| J' (by station) | | 0.635 | | | 0.683 | | | 0.219 | | |

TABLE 6. List of outside taxonomic experts consulted and their area(s) of expertise.

Dr. Jon F. Norenburg, Smithsonian Institution (Nemertina, Platyhelminthes)

Dr. Donald R. Moore, University of Miami (Mollusca)

Dr. Michael Milligan, Center for Systematics and Taxonomy (Polychaeta and Oligochaeta)

Dr. Julie Piraino, Smithsonian Institution (Sipuncula)

Dr. Mary Rice, Smithsonian Institution (Sipuncula)

Dr. Louis Kornicker, Smithsonian Institution (Ostracoda)

Dr. James D. Thomas, Smithsonian Institution (Amphipoda)

Ms. Barbara Maloney, Florida International University (Cumacea).

Dr. Rafael Lemaitre, Smithsonian Institution (Decapoda)